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OCCUPATIONAL JOB REQUIREMENTS, A SHORT-CUT APPROACH TO LONG-RANGE FORECASTING.

BY- MEDVIN, NORMAN
BUREAU OF EMPLOYMENT SECURITY, WASHINGTON, D.C.

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THE AREA SKILL SURVEY, THE BEST KNOWN AND LONGEST USED TECHNIQUE FOR FORECASTING LONG-RANGE OCCUPATIONAL REQUIREMENTS, HAS COME IN FOR SEVERE CRITICISM ON THE GROUNDS THAT IT IS TOO EXPENSIVE AND TIME-CONSUMING AND THAT MOST EMPLOYERS ARE NOT GOOD ECONOMISTS. A NEW TECHNIQUE IS DESCRIBED, THE EMPLOYMENT SERVICE UNFILLED JOB OPENINGS, OCCUPATIONAL OUTLOOK HANDBOOK APPROACH. ITS ELEMENTS ARE THE UNFILLED JOB OPENINGS IN A LOCAL EMPLOYMENT OFFICE, IDENTIFICATION OF THOSE JOBS OPEN 30 DAYS OR MORE, AND THE ADDITION OF A NATIONAL FORECAST (OBTAINED FROM THE OCCUPATIONAL OUTLOOK HANDBOOK) TEMPERED BY THE LOCAL ANALYST'S KNOWLEDGE AND SUPPLEMENTED BY A FEW ASSOCIATION VISITS. IT IS ESTIMATED THAT THE CONDUCT OF SUCH A SURVEY TO SATISFY VOCATIONAL EDUCATION, MANPOWER DEVELOPMENT AND TRAINING ACT, AND OFFICE OF ECONOMIC OPPORTUNITY NEEDS WOULD TAKE A SINGLE MANPOWER ECONOMIST AN AVERAGE OF NOT MORE THAN 6 WEEKS FOR A SURVEY IN A METROPOLITAN AREA. TOTAL COST TO THE EMPLOYMENT SERVICE FOR 150 AREAS, ALL AREAS TO BE COMPLETED IN 1 YEAR, WOULD BE UP TO $200,000. SKILL SURVEYS, NOW USED, MAY COST AS MUCH AS $100,000 FOR ONE LARGE CITY. THIS ARTICLE IS A REPRINT FROM EMPLOYMENT SERVICE REVIEW, JANUARY - FEBRUARY 1967. (PS)

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Occupational Job Requirements: A Short-Cut Approach to Long-Range Forecasting

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Occupational Job Requirements: A Short-Cut Approach to Long-Range Forecasting

NORMAN MEDVIN

The following technique of making long-range occupational forecasts is one of several proposals under discussion in the U.S. Department of Labor.

The past few years have witnessed the growth of a lively interest among the general public, an increasing concern by government and private administrators, and what can be only described as feverish activity on the part of some specialized economists and econometricians, toward the problem of creating a viable technique for forecasting long-range occupational job requirements.

Collection of occupational data and its corollary spin-off, the evolution of long-range forecasting techniques, have lagged behind other aspects of the job market information program for obvious reasons. The expense in collecting data by occupation, burdensome employer reporting, the technical ability to translate employer job titles into a standard occupational nomenclature, and difficulty in creating acceptable forecasting techniques are some of the more important reasons why this area of knowledge has not progressed as far as other job market statistical programs.

The spate of manpower legislation in the first half of the sixties, however, placed an urgent priority on the expansion of occupational information. In providing funds for manpower training, the Congress foresightedly wrote in the Area Redevelopment Act of 1961 that before any training courses could be approved, there had to be a "reasonable expectation of employment" for the trainees upon course completion.[1] This all-important phrase was repeated in the Manpower Development and Training Act of 1962 [2] and the concept was carried over into the Vocational Education Act of 1963.[3] No longer was it possible to deal in platitudes or vague references to job opportunities. If a class in welding was to be considered in Milwaukee, then a precise determination of employment opportunities had to be made in advance for that specific occupation in that specific place. And if the course was to run for a period of time, then the determination of employment prospects had to extend certainly up to, and preferably beyond, the end of the training period. Enter the need for a forecasting technique.

Norman Medvin is a Manpower Economist, U.S. Employment Service, Washington, D.C.

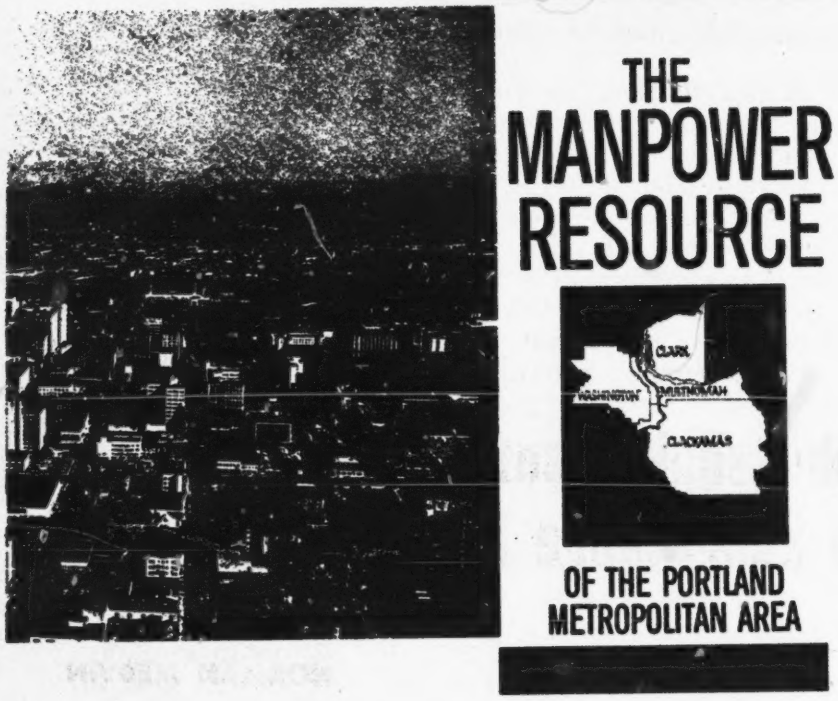
Current Research in Forecasting

Considerable experimentation has occurred and is taking place in developing acceptable techniques for long-range occupational forecasting. As might be expected, the U.S. Department of Labor through two of its com-

[1] *Area Redevelopment Act, Public Law 87–27, May 1, 1961, sec. 16(b).*

[2] *Manpower Development and Training Act of 1962, Public Law 87–415, Mar. 15, 1962, title II, pt. A, sec. 202(d).*

[3] *Vocational Education Act of 1963, Public Law 88–210, Dec. 18, 1963, sec. 5(a)(4).*



ponent elements—the Manpower Administration (which includes the U.S. Employment Service) and the Bureau of Labor Statistics—is deeply involved.

The USES and its affiliated State Employment Services have basically relied on the area skill survey technique and training needs surveys as a means of estimating future occupational requirements. These in turn rest primarily on the validity of an employer forecast of occupational employment in his establishment 1, 2, or 5 years hence which is summarized for an area or an entire State. An aspect of this approach is the development of technical school graduates and promotions to the job, all of which are arrayed against employer demand for a net demand figure by occupation.[4] Some 170 of these skill surveys have been completed over a period of 6 to 8 years and 44 are in process.

Both the USES and its affiliated Wisconsin State Employment Service are currently experimenting on a model system of gathering occupational information of which forecasting is one of the areas to be explored. The USES has also engaged a private consulting firm to devise an acceptable forecasting plan.[5]

The Employment Service has been active in other avenues of inquiry relating to long-range forecasting. The Michigan State agency in cooperation with the Battelle Memorial Institute is developing a model forecasting technique for the State of Michigan and for Detroit separately which attempts to measure supply as well as demand.[6] The State agency is also experimenting with current occupational counts, frequently the base for employment projections, through a conversion of the listings in the R. C. Polk city directories.

The California State Employment Service experimented with an innovative approach in which an attempt was made to marry the decennial census data with an economist's knowledge of local area manpower and economic conditions.[7]

The Manpower Administration, through funds available to it under title I of the Manpower Development and Training Act, awarded individual contracts to the Colorado and Temple Universities to experiment with long-range occupational forecasting techniques. Both of these universities developed models of local occupational employment projections based primarily on the use of decennial census data.[8] In neither case was there any adjustment for available supply of manpower.

One of the more important techniques for projecting national occupational levels is one developed by the Bureau of Labor Statistics which involves preparation of an economic model by building up demand for each product in an industry, manpower requirements of each industry consistent with this demand, and finally, the development of an occupational matrix. For a grid which has 116 industries in the caption and some 150 occupations in the stub, BLS technicians have painstakingly over a 16-year period filled in the cells so that today the have what is tantamount to 116 industry manning tables for 1960, that is, occupational distributions of employment for these industries. By applying their know-how of industrial and occupational trends, they have constructed a duplicate matrix for the year 1975 to be released in early 1967. By obtaining the difference from one pattern to the other, they in effect have a demand chart by industry and occupation over the 15-year period. A third matrix for the

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[4] Handbook on Employment Security Job Market Research Methods—Area Skill Survey, *BES No. E–252, November 1965.*

[5] *"Outline of Suppplement to the Handbook on Employment Security Job Market Research Methods, BES No. E–252, November 1965." A preliminary paper for discussion purposes only, prepared by John Fletcher Wellemyer Associates for the USES, Nov. 15, 1966.*

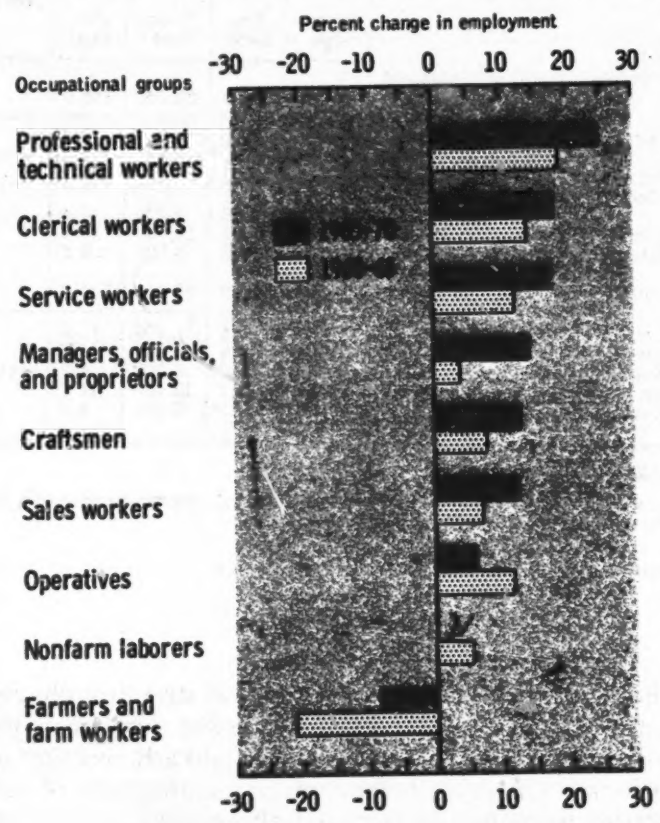
[6] Michigan Manpower Study, *November 1966, Michigan Employment Security Commission (research conducted by Battelle Memorial Institute, Columbus, Ohio).*

[7] Manpower Resources, San Francisco-Oakland Bay Area, *1960–70, California Department of Employment, May 1963.*

[8] Methodology for Projection of Occupational Trends in the Denver Standard Metropolitan Area *by L. Fishman, W. E. Roberts, C. M. Franks, and W. McCormick of the University of Colorado is an evaluation of the state of the art of projecting occupational demand for local manpower. The authors include a theoretically "ideal" methodology and data collection technique with each of their assessments of the precision and adequacy of the currently used occupational forecasting methods.*

Projective Models of Employment by Industry and by Occupation for Small Areas: A Case Study (Part I) *and a* Manual for the Development of Estimates of Future Manpower Requirements for Training Purposes (Part II) *by L. T. Harms, R. James, and R. C. Springer of Temple University presents a detailed description of manpower forecasting models derived by the authors and an example of the models' application to manpower estimates in one particular county. Pt. II of the report is a "how-to-do-it" step by step description of the procedures involved in making local area employment estimates.*

Employment growth in most occupations will speed up over next half decade.



1/ 1965-70 employment of nonfarm laborers is projected at about the absolute level of the past decade.

Source: U.S. Department of Labor.

year 1965 is scheduled for completion in 1967. In each of these models, there is a lack of manpower supply figures for occupations other than professional and some highly skilled.[9]

Obviously, there are many efforts in the occupational forecasting field which have not been mentioned. Some like the Arizona Employment Service approach may be considered variants of the area skill survey approach. Others, like in the New York State Department of Labor, are an effort to apply the concepts of the BLS matrix approach to a local situation. Some techniques like occupational listings from the Internal Revenue Service quarterly contribution reports and a new technology approach which assumes that a technologically advanced plant foreshadows the average occupational distribution for the industry some years hence are in an embryonic stage or not yet sufficiently tested.[10]

Major Difficulties Remain

A gap which is inherent in studies to date, with such exceptions as the area skill survey, Michigan-Battelle technique, and, to some extent the BLS model, is the absence of labor supply figures. It is entirely possible, for example, for employment in an occupation to increase over a period of time but at the same time for the existing forces in the job market to supply those workers. Thus, one may project an enormous demand for file clerks but because any high school graduate could be part of the potential supply, a prospective shortage would be unlikely. It would be highly dubious to plan training courses on the basis of demand alone. Perhaps more importantly, one might have difficulty in using only a demand figure to satisfy the "reasonable expectation of employment" clause since the funding of training courses and successful job search is tied to a shortage concept.

Existing techniques suffer from other limitations. They are (1) extremely expensive (a skill survey for a large city may run to $100,000); (2) extraordinarily complex (the Temple University study, in our opinion, could hardly be applied at numerous local levels with existing funds, skills, and data processing resources); (3) too time consuming (skill surveys which should theoretically take 4 to 6 months to produce preliminary and usable results most frequently take much longer. Some of the other studies in the experimental stage have not yet been applied but an objective judgment leads to the conclusion that they, too, would take inordinately long); (4) not applicable to a local scene (the BLS matrix is an excellent national planning document but is not tied to local situations without additional specific adaptation); and (5) not feasible on a frequent basis because of cost, complexity, and time.

A note of urgency compounds the situation. The Vocational Education Act of 1963, in allocating hundreds of millions of dollars for vocational training, specifically gives a mandate to the Employment Service system to provide job market information to the vocational school system. The State Employment Services with no additional funding and with the traditional and costly skill survey technique available to them, have in many instances been unable to furnish the information which by law they are obligated to provide.

There have been a number of instances in which the State vocational education people have attempted to get the information themselves, or have financed private consultants or universities to obtain the information for them. It is clearly paradoxical that the Employment Service with the most know-how in the manpower field fre-

[9] *For information on the matrix, see "Long-Term Manpower Projections." Institute of Industrial Relations, University of California, 1966, "Estimates of Employment Requirements by Occupation for Future Periods—Data Sources and Model Development," Harry Greenspan.*

[10] *See footnote 8 on the University of Colorado Study. This report contains an extensive bibliography of manpower research in the occupational forecasting field.*

quently finds itself sitting on the sidelines while money is being distributed to others with far less experience to do the job. In one of the States, an outside consultant who had been hired to make job market surveys for the local education authorities approached the USES in Washington on techniques to accomplish the task and then offered to hire the responsible staff member to make the surveys.

No additional budgeting is in prospect for the Employment Service for skill surveys until fiscal year 1968 at the earliest, and it is problematical that such funds will be forthcoming then. In the meantime, the needs of the vocational education authorities grow more pressing by the day. In a handful of States, the State vocational education group has cooperated with the State Employment Service in funding part of the costs of a skill survey but this cost sharing, on the basis of present evidence, will continue to be exceptional.

Need for New Technique

There is little evidence, based on the availability of current techniques and known experimentation, that a viable method of long-range forecasting of occupational requirements on a local basis will be operational on a national basis before calendar year 1968. Excluded, of course, is the skill survey approach which is operational but which is handicapped by lack of funding. There can be no argument that a new technique is needed as quickly as possible to permit the Employment Service to discharge its function of providing long-range occupational information to the vocational education system that would also serve the Employment Service itself in carrying out its responsibilities under the Manpower Development and Training Act.

Two Myths

Before proceeding with the task at hand, it is necessary to demolish two myths which frequently divert many technicians in achieving a modus operandi in the long-range occupational forecasting field.

The first is the one which concerns "emerging occupations." Many prefaces to research designs and preambles to legislative proposals in the field of occupational job market information have as one of their cardinal objectives the searching out of new occupational opportunities created by changing technology. Laymen repeat the phrase and give substance to the idea, conveying the notion that to ferret out these elusive but all-important developments is to take a giant stride in harnessing the opportunities of tomorrow. There is a practitioner in the forecasting field who places major emphasis on this element, in the course of which he allocates a significant proportion of his total expenditures to interviewing hundreds of employers for a series of qualitative judgments, many of which are akin to curbstone opinion and guesses. Even if these judgments were reasonable and even if it were possible to quantify them, it does not seem that the emerging occupations could have more than a slight impact on the job market for years to come.

Major Occupational Groups of Workers, Actual 1964 Employment and Projected 1975 Requirements

[Number in thousands]

Occupational group	1964 Employment		Projected 1975 Requirements		Percent change, 1964–75
	Number	Percent	Number	Percent	
Total, All occupational groups	70,357	100.0	88,700	100.0	26
White-collar workers	31,125	44.2	42,800	48.3	38
Professional and technical	8,550	12.2	13,200	14.9	54
Managers, officials, and proprietors	7,452	10.6	9,200	10.4	23
Clerical workers	10,667	15.2	14,600	16.5	37
Sales workers	4,456	6.3	5,800	6.5	30
Blue-collar workers	25,534	36.3	29,900	33.7	17
Craftsmen and foremen	8,986	12.8	11,400	12.8	27
Operatives	12,924	18.4	14,800	16.7	15
Nonfarm laborers	3,624	5.2	3,700	4.2	(1)
Service workers	9,256	13.2	12,500	14.1	35
Farm workers	4,444	6.3	3,500	3.9	−21

[1] Less than 3 percent.

NOTE: Projections assume a 3-percent level of unemployment in 1975. Percents do not add to totals due to rounding.

Source: U.S. Bureau of Labor Statistics.

The fact of the matter is that the job structure changes rather slowly and that the overwhelming number of jobs and subsequent opportunities are in already existing occupations. Outside of the unusual emergence of new industries infrequently over a half century, it is a fact that most new industries call largely for existing skills. Moreover, emerging skills occur in very small numbers and when they do, it is most usual for the machine manufacturer or the machine user to train the worker for the job. By the time the number of workers in the occupation increases substantially, it has undoubtedly been identified in the mainstream of job market information.

Evidence of the numerical importance of the older jobs in the economy is shown by the fact that since the inception of the MDTA program, institutional training in 10 occupations, none of which were new to the postwar economy, accounted for the bulk of the enrollments in the program.[11]

The second myth concerns the drive for preciseness in forecasting projections. Models stand or fall on how close the projections are to the actual. Econometricians compute changes to one decimal point. Evaluation studies are conducted repeatedly for accuracy.[12] Endless

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[11] *Statement of Stanley H. Ruttenberg, Assistant Secretary of Labor and Manpower Administrator before the General Subcommittee on Education of the House Committee on Education and Labor on Vocational Education Act of 1963, Aug. 16, 1966.*

[12] *An Appraisal of Area Skill Surveys in Battle Creek, Mich., and Trenton, N.J., November 1965, John Fletcher Wellemyer Associates, Washington, D.C.*

arguments ensue on whether the economist or the employer should make the forecasts on the assumption that one is more accurate than the other.

Of course, any technique which produces a precise, or reasonably precise, long-range forecast is devoutly to be desired. It is our contention, however, that this straining for exactitude *in the field of counseling and training* is spurious and largely unnecessary.

What does it mean, for example, when an estimated need in an occupation is 500, that the true need is 250 or 750 (assuming it were possible to ascertain the figure), and that there are only physical facilities or funds for two classes of 25 each? Again, why the heavy emphasis on an elaborate econometric model when either before the study takes place or after it is completed, the economist programs a major correction factor based on judgment or other nonquantitative data? This was an actual occurrence in a heavily financed study which tried to arrive at a technique at a point far removed from the area actually involved by using Census and other data. It was subsequently conceded that there should have been local contact to obtain "the intimate knowledge of an area which only residents have or which can be produced by visits." An obvious plea to temper statistics with merciful judgment.

We conclude with respect to this myth, and as it is applicable to the field of job forecasting to satisfy training requirements, that it is sufficiently accurate to achieve only the *proper direction* of employment change. In addition to direction, it would be useful to have a *magnitude* of need and this can be achieved without satisfying the presumed need for preciseness. Moreover, if a technique can be devised to repeat a survey quickly and inexpensively, say every 6 months or a year, how much better would that approach be than one which is locked into an estimate arrived at by a survey which because of its costs, can be repeated only at 3- to 5-year intervals.

Elements of a New Technique

The proposed methodology can perhaps be described as the "Employment Service unfilled job openings—Occupational Outlook Handbook" approach after its two basic components. Two to three years from now, its name might change to the "Job Vacancy—Occupational Matrix" approach since these two components will be the improved versions of the earlier elements.

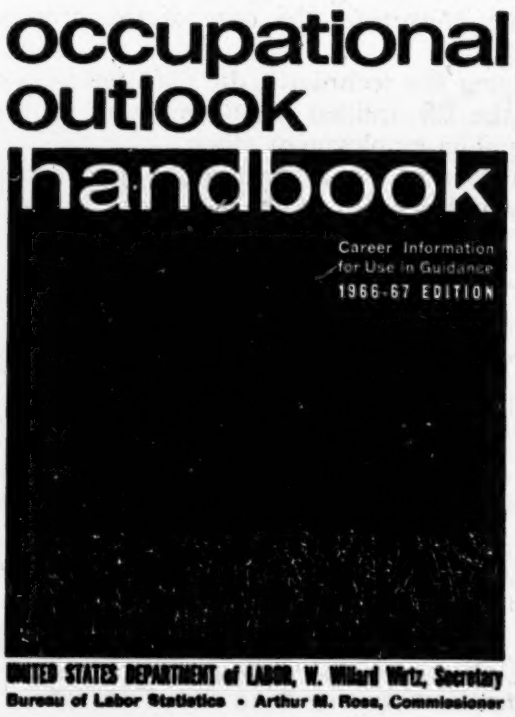
Unfilled job openings are those live job orders given by employers to the Employment Service which at the time of count remain unfilled because of a shortage of applicants or inability to find applicants who meet the employer's job specification.[13] Unfilled job openings are collected on a quarterly basis by the Employment Service in 80 of the largest metropolitan areas in the country. Plans are already underway to extend this collection to 150 areas comprising some 70 percent of the Nation's employment.

Job vacancies as used here are the universe of job openings in an area. As such they differ from ES unfilled job openings in that the latter represent that portion of the universe of job vacanies given to the Employment Service.

The OCCUPATIONAL OUTLOOK HANDBOOK is the Bureau of Labor Statistics' outstanding contribution to the training and guidance fields. Published biannually, the Handbook provides current and long-range information on occupations concerning 90 percent of the 16 million employed in professional, managerial, and technical occupations; nearly all of the 4.5 million sales workers; about half of the 10.7 million clerical workers; and about 40 percent of the 9.3 million service workers.

The BLS *occupational matrix* (see above for description) will provide *quantitative* information on current employment and long-range forecasts of employment by occupation. Most of the forecasts in the current OCCUPATIONAL OUTLOOK HANDBOOK are *qualitative* in nature.

The final basic tool in the proposed technique is the new and recently issued third edition of the *Dictionary of*



[13] *This is not precisely true since some job orders may have been given to the Employment Service so close to the time of count that there had not been sufficient opportunity to attempt to fill them.*

Occupational Titles.[14] The Dictionary contains 18,000 defined job titles arranged in an innovative structure which has unique connotations for the proposed forecasting methodology.

ES Unfilled Job Openings

ES unfilled job openings by detailed occupation is an administrative statistic which has been available in the Employment Service for many years. Yet it was only recently, as a result of the first experimental job vacancy studies in the United States in fiscal year 1965, conducted by the U.S. Department of Labor that the true dimension of the unfilled job openings figure became known.

The job vacancy data showed that for the country as a whole, ES unfilled job openings in April 1965 accounted for 30 percent of the universe of job vacancies.[15] In the second round of experimentation, in April 1966, the ES share of total job vacancies had increased to 37 percent. This average proportion of the job market which incidentally excludes domestic service, varied by area in April 1965, ranging from 13 percent in the lowest area to 44 percent in the highest.[16]

The relationship of ES unfilled job openings to total occupational needs in a community was literally a research bombshell to the Employment Service system and to many public and private economists. Domestic and foreign manpower experts were surprised to learn that the ES job market exposure compared favorably with some of the highly regarded systems abroad where the employment service is an instrument of an active manpower policy and completely acceptable to the entire community.[17] It is the ES unfilled job openings' penetration of the job market that constitutes the core of the proposed new methodology.

In applying the technique, the first step is to obtain a listing of the ES unfilled job openings in an area from the local public employment office.

These will most frequently be in 3-digit occupational groups [18] whether based on the second edition or the third edition of the DOT. It is a matter of relative ease for the Employment Service to provide occupational detail beyond the 3-digit level.

The most important element in the unfilled job openings figure is *not* the absolute level of the openings by occupation but a corollary figure, namely the number of unfilled openings that have been *unfilled for 30 days or more.*[19] It is the number and percentage that unfilled openings 30 days or more is to total unfilled openings for any 3-digit (or 6-digit) occupation over a period of time that provides the indispensable clue to current shortages and to a long-range projection in that occupation or occupational group.

These unfilled jobs open 1 month or more and their relation to total unfilled openings for each occupation should be evaluated for successive quarters, for a minimum of one year if possible, since seasonality will vary the figures of some occupations substantially.

If the hard-to-fill percentage for an occupation over a period of quarters ranges over 30–40 percent for a number of quarters, there is evidence to indicate that the occupation in large measure is in a continuing shortage situation, certainly up to the most recent compilation. These occupations should be identified on a listing and will form the cohort for the next step.

Starting with the list of hard-to-fill occupations, and using the actual number of hard-to-fill openings, that is, those unfilled 30 days or more, as a criterion, the listing should be subdivided into a number of categories. The subdivisions will be subjective depending on the size of area and an analysis of the array. In a large metropolitan area, for example, those occupations with more than 100 hard-to-fill openings which tend to be repeated over a period of time should go into the first category. Into the second category might be placed those which have between 20 and 99 hard-to-fill openings. The remainder of the occupations will constitute the final category.

In medium-sized and smaller areas, the categories should be scaled down by rule of judgment.

The Wage Factor

The ES reporting program not only collects hard-to-fill openings but also the reason for their being hard-to-fill. The category of reasons for hard-to-fill are (1) shortage of qualified workers; (2) low wages; (3) working conditions; and (4) other. Low wages as defined here is not a substandard wage since the Employment Service is not permitted to accept such job orders. Rather it is a low wage in relation to other jobs in the area.

On the other hand, if job vacancy data are used rather than unfilled job openings, a certain number will be hard-to-fill because they pay substandard wages for the occupation. On a national basis, this proportion amounts to a little under a fifth of the vacancies.[20] Consequently,

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[14] Dictionary of Occupation Titles, *1965 vols. I and II, third edition, U.S. Department of Labor, Bureau of Employment Security.*

[15] *Hearings before the Subcommittee on Economic Statistics of the Joint Economic Commitee, 89th Cong., May 17 and 18, 1966. Statement of V. D. Chavrid, Director, Office of Manpower Analysis and Utilization, U.S. Employment Service.*

[16] *Findings and Implications of the Job Vacancy Experimental Program, conducted during FY–1965 and FY–1966, USES, a preliminary paper dated Sept. 8, 1966.*

[17] *"The Measurement and Interpretation of Job Vacancies"; a conference report of the National Bureau of Economic Research, Columbia University Press, New York, 1966.*

[18] *All DOT occupations are grouped into nine broad categories identified by the first digit 0–9. These nine categories are divided into 84 two-digit divisions, and the divisions, in turn, are subdivided into 603 distinctive three-digit groups. The latter are subdivided into some 3,100 six-digit occupations containing some 18,000 defined jobs.*

[19] *These duration data are collected quarterly by the ES as part of its 80-city survey.*

[20] *Hearings before Subcommittee on Economic Statistics, pp. 74–75. (See footnote 15 for full reference.)*

a refinement may be introduced into the vacancy data by using the hard-to-fill figure less those attributed to substandard wages.

Are jobs which cannot be filled because of low wages in relation to the community wage structure to be considered as unsuitable for training? This problem has been the subject of an evolving philosophy with many ramifications and is covered in a number of administrative orders and policies within the Labor Department's Manpower Administration.[21] Among other things, the policy is not to fund a MDTA training course for an occupation which pays below the national minimum wage. On the other hand, jobs in short supply because of a low wage which, nevertheless, pay above the minimum wage and the prevailing wage in the community are considered trainable occupations from the standpoint of the law. The means taken to assure that trainees will accept such jobs is to screen them and elicit their attitudes in advance. Frequently, these trainees are disadvantaged and the prevailing wage, although low, is more than they have been accustomed to receiving.

While the foregoing is obviously not intended to be a sophisticated discussion of the wage problem in assessing opportunities, it highlights a difficult problem which the Employment Service faces up to all the time in such determinations.

Expansion Via Job Vacancy Data

The next step in the progression of this technique is to relate long-duration unfilled job openings to the universe of hard-to-fill vacancies in the area, if such data are available. This relationship will produce a series of factors by which a "blowup" of the unfilled job openings data to universe proportions will become possible. Depending on the scatter of the data, the blowup factor could be applied at the one-digit occupational level, or the three-digit, or even the six-digit level. Because of seasonal changes, care should be exercised to use like time periods in expanding the data.

It is assumed, of course, that job vacancy surveys would be patterned after the Department of Labor experimentation which recommends collection of vacancy data by detailed six-digit DOT titles, a breakout of hard-to-fill vacancies (jobs vacant 30 days or more), and wage data for each job vacancy.[22]

The Congress once again turned down departmental requests for an extension of the vacancy program to 80 major metropolitan areas for fiscal year 1967. An assessment of prevailing administration and congressional mood in the light of low unemployment rates and Vietnam expenditures would seem to indicate that funding of an expansion of the job vacancy program beyond the current experimental pace is not in the offing. Nevertheless, there are a number of mitigating circumstances which can be used to harness this tool for greater usefulness in the current technique.

First, the current experimental surveys for which Congress has appropriated funds for 3 successive years covers some 16 areas comprising one-fourth of the Nation's work force. By itself, the relationship of job vacancies to job openings by occupation for so large a segment of the country is a major contribution to establishment of a blowup factor for more accurately determining area needs.

Second, the same experimental program has the potential for expanding the vacancy program. As now costed out, the appropriations permit conduct of surveys in 16 areas two times a year. If each of these 16 areas were to conduct one survey per year, the money so saved could be used to introduce at least a like number of areas to the program. By so doing, areas with perhaps as much as 40 percent of the Nation's work force could be establishing job vacancy benchmarks against which to expand the Employment Service unfilled job openings figures.

The Occupational Outlook Handbook (OOH)

The OCCUPATIONAL OUTLOOK HANDBOOK is a document of prime importance containing some 850 pages of data covering outlook for more than 700 occupations. Projections are on a national basis and most frequently of a qualitative nature. Forecasts are compiled by a group of trained economists in the Bureau of Labor Statistics utilizing resources within the Labor Department. To this is added the resources of other governmental agencies the trade associations and unions.

This major work, updated every 2 years, enjoys national distribution and is a basic tool for all Employment Service counselors. Employment Service familiarity with the OOH makes it an ideal component for use in the proposed techniques.

The next step, after an array of occupations in short supply by category of volume is achieved, is to make an assessment of long-range opportunities in those occupations. This is accomplished by reference to the OCCUPATIONAL OUTLOOK HANDBOOK with its national projections by occupation. Against each of the occupations listed in the array, a notation would be made of national long-range opportunity, adding by some prearranged code the size of the occupation and the intensity of growth and shortage. A simplified approach would be for the Bureau of Labor Statistics to make a determination of long-range demand based on size and intensity of need for all the occupations listed in the Handbook as they have already done for skilled occupations.[23] Once done, this would be distributed to all users and would have the effect of substantially cutting down on the time needed for individual determinations and also provide uniformity in the interpretation of the data.

At this point, the economist brings to bear a series of judgments and interpretations, the same as he would

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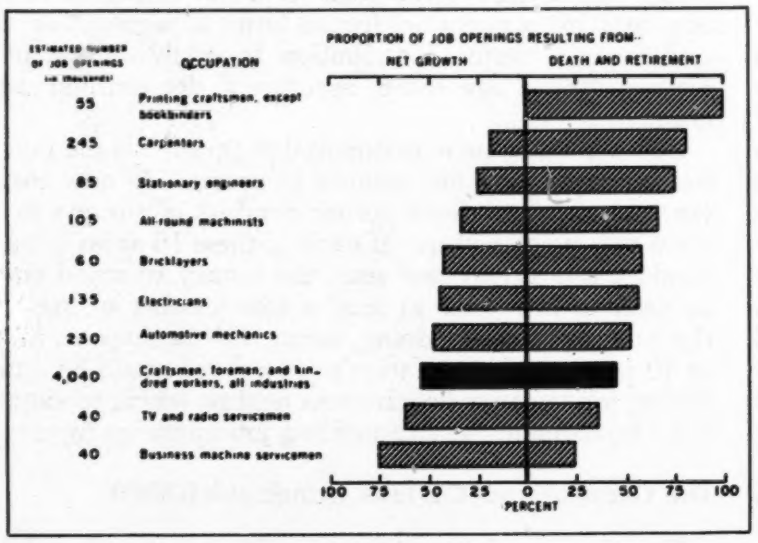
[21] *Manpower Administration Order 33–65, "Wage Rates Appropriate to MDTA Projects in Occupations Not Covered by the Minimum Wage Act," Dec. 29, 1965, and U.S. Employment Service Program Letter 1994, Mar. 25, 1966.*

[22] *Instructions for Obtaining Area Job Vacancy Information," USES, Mar. 15, 1966.*

[23] *"Estimated Need for Skilled Workers, 1965–75," MONTHLY LABOR REVIEW, April 1966, U.S. Department of Labor.*

Estimated Job Openings for Skilled Workmen in Selected Occupations, 1965–75



Source: U.S. Bureau of Labor Statistics.

under any other technique employed by him. Where the number and percent of hard-to-fill is large and has been large for some time, and where the Handbook indicates national expansion, it is entirely reasonable to assume that expansion will occur in the area.

Is there any danger in applying the national trend to the local scene? On the whole, we think not because the bulk of the areas where the occupation exists of necessity will follow the point of central tendency; namely, the national projection. Moreover, and this point needs emphasis for it is the crux of the matter, *it has already been determined in advance that these occupations exist in large numbers in the community and have already been adjudged hard-to-fill on a past and current basis.* Conversely, the danger of applying a national projection to a local area would be real where the occupation existed in very small numbers and did not have a hard-to-fill history.

Let us examine existing situations in which a national forecast might be applied to a local area and determine whether such situations can be rationalized. Keep in mind that in each of the illustrations, the occupations exist in important numbers in the community and that there currently exists, and has for a year or more, a condition of shortage:

1. *The cross-industry occupation.*—If the national projection indicates expansion for such occupations as bookkeeper, stenographer, or office machine operator, the broad-based nature of the occupation in the community would present little chance for deviation from the national trend.

2. *The specific industry-occupation tied to broad-gaged income trends.*—If the national projection shows expansion for such occupations as bank teller, barber, and occupations in cleaning establishments, the risk of applying growth to a specific community (where shortage already exists) is quite minimal.

3. *The specific industry-occupation tied to national growth and institutional factors.*—Would anybody question the application of national growth in nurse and other hospital occupations to a local community where there is already abundant evidence of shortage in these same occupations?

4. *Another possibility.*—What about the occupation in a specific industry in which the national long-range projection is favorable, in which there are current local reports of shortage of certain workers in that local industry, but in which the long-range projection for the plant in the community is *not* favorable. We have in mind the Studebaker situation in South Bend where there might have been needs reported for tool and die workers and machinists up to the day it was announced that the plant was going out of business. The economist in this case, knowing the precarious status of the corporation, would make an adjustment reducing the size of the local need.

But suppose, as actually happened, the intention to close was a closely guarded secret? The answer is obvious. No other known technique of forecasting can or would have produced the right answer either. As we will either say or imply throughout this paper, the unfilled openings-OOH approach is *better* than most forecast devices in many instances and *no worse* than most such devices in other instances. Saying it another way, the unfilled openings-OOH technique is capable of making the same error as other techniques but with much less cost, trouble, and effort.

5. *The industry-occupation which is expanding in a local community but for which the national prognosis is contraction.*—An illustration could be the location of a mechanized meatpacking plant in a new community to consolidate the operations of one or more inefficient plants elsewher. The local economist can be reasonably secure in his judgment that the recently constructed operation is competitive with the best in the industry and hence would have to be regarded in a different light from the employment downtrend in the industry as a whole. If such a plant exhibited hard-to-fill openings over a period of time, rule of judgment would seem to indicate a positive training decision.

Application of the ES unfilled openings-OOH technique to the District of Columbia metropolitan area afforded insight into the applicability of the OOH data to the District of Columbia's unfilled job openings series. Of the 65 occupations, some three-digit, some six-digit, from the unfilled openings listing that warranted seeking long-range information, usable data were available for 50 of them in the OOH. The 15 for which there was no information were mostly semiskilled and unskilled jobs such as messengers, charwomen, demonstrators, porters, guards and watchmen, and other groups of unskilled such as laundry workers, warehousemen, and packing, filling, and labeling workers.

It is not altogether surprising that these occupations should have been omitted from the OOH. They required little or no training time and there may have been a prevailing opinion that enough workers would always be

Employment of Nonagricultural Wage and Salary Workers, by Industry, 1964, and Projected Requirements, 1975 [1]

[In thousands]

	Actual 1964 employment	Projected 1975 requirements	Percent change
Total	88,156	75,875	30
Mining	633	620	(2)
Contract construction	3,056	4,190	37
Manufacturing	17,259	19,740	14
Durable goods	9,813	11,500	17
Ordnance and accessories	247	250	(2)
Lumber and wood products, except furniture	603	550	−9
Furniture and fixtures	406	510	26
Stone, clay, and glass products	612	675	10
Primary metal industries	1,231	1,290	5
Fabricated metal products	1,187	1,460	23
Machinery	1,606	2,050	28
Electrical equipment and supplies	1,548	2,000	29
Transportation equipment	1,605	1,730	8
Motor vehicles and equipment	755	800	6
Aircraft and parts	604	575	−5
Instruments and related products	369	510	38
Miscellaneous manufacturing industries	399	475	19
Nondurable goods	7,446	8,240	11
Food and kindred products	1,746	1,665	−5
Tobacco manufacturers	89	80	−10
Textile-mill products	891	880	(2)
Apparel and related products	1,302	1,525	17
Paper and allied products	625	775	24
Printing, publishing, and allied products	951	1,100	16
Chemicals and allied products	877	1,125	28
Petroleum refining and related industries	183	160	−13
Rubber and miscellaneous plastic products	434	580	34
Leather and leather products	348	350	(2)
Transportation and public utilities	3,947	4,425	12
Trade, wholesale and retail	12,132	16,150	33
Finance, insurance, and real estate	2,964	3,725	26
Services and miscellaneous	8,569	12,275	43
Total government	9,595	14,750	54
Federal government	2,348	2,525	8
State and local government	7,248	12,225	69

[1] Projections assume an unemployment rate of 3 percent in 1975.
[2] Less than 3 percent.

NOTE: Because of rounding, sums of individual items may not equal totals.

Source: U.S. Bureau of Labor Statistics.

available for unskilled jobs. In fact, omission of many of these types of occupations from the OOH, from BES skill surveys, and from State ES occupational guide programs lent support to contentions of the Office of Economic Opportunity that the Department of Labor was not sufficiently sensitive to the needs of the poverty-type, disadvantaged workers for whom these jobs could provide numerous opportunities.[24]

[24] *The Manpower Administration has for approximately a year prior to the date of this writing reoriented its training policy. The policy now provides that some two-thirds of MDTA expenditures are to be allocated to making disadvantaged groups employable and one-third to training for higher skill occupational shortages.*

The experimental job vacancy and unfilled job openings surveys demonstrated clearly that there were many jobs of a semiskilled and even unskilled nature that could not be filled for at least 30 days, with the difficulties not being attributed to low wages.

The ES unfilled job openings-OOH technique, by its design, picks up this generally neglected group. If these occupations have a substantial number of hard-to-fill jobs as shown by the unfilled job openings survey, they are included in the original list of occupations for study. The hard-to-fill figure is considered a measurement of needed supply, no matter how many such workers may be listed in the active file of the employment office. If wages is not the factor for inability to fill the job, and it is unlikely since the Employment Service cannot accept job orders paying less than the prevailing wage, it can be concluded that a shortage of workers exists at the time of the survey under prevailing conditions. If this shortage has prevailed for three or four successive quarters, and one assumes further that relatively full employment conditions will prevail, the information thus obtained can provide information on job opportunities and training needs for lesser skilled workers.

Occupations with Small ES Penetration

A major difficulty in applying this technique is related to those occupations in which the Employment Service does relatively little business and in which the number of unfilled openings is consequently small. Thus, banks may not be likely to come to the Employment Service for recruitment. Local utilities, railroads, craft unions, etc., may similarly conduct the bulk of their recruitment elsewhere. For a relatively large metropolitan area, for example, this situation may show up in the unfilled openings tabulations as nine openings for printing pressmen with six of them indicated as hard-to-fill.[25] A perusal of unfilled job opening lists in a number of cities shows many entries of this type.

Were these entries to represent little or no demand for workers in the community, they would not concern us. If, on the other hand, the unfilled job openings number is small in the Employment Service but large in the community, they are of direct importance to the forecasting process. The Employment Service people in the community will know how to make a distinction between these two groups because they have learned over time and through job development efforts which are the employers, industries, and occupations where they have small representation.

Apart from local office knowledge and judgments, however, there are certain safeguards written into the situation. In terms of *total actions* in the job market, the bulk of such actions take place in a relatively few occupations. Thus, only 43 (three-digit) occupations comprise 66 percent of the total job vacancies and these same

[25] *Actual listing for the District of Columbia metropolitan area for June 1966. This appears to be a clear case of under-representation, since the area is a relatively large printing center.*

Job vacancies and unfilled job openings: Selected three-digit occupations[1] as a percent of each major occupational group

Major occupational group	Percent of all job vacancies	Percent of all unfilled openings
Total, all groups, 43 occupations	66	58
Professional and managerial, 11 occupations (including 6 categories of engineers)	62	65
Clerical and sales, 11 occupations	78	64
Service,[2] 4 occupations	62	47
Skilled, 8 occupations	58	50
Semiskilled, 5 occupations	71	64
Unskilled, 4 occupations	[3] 56	27

[1] List of 43 selected 3-digit occupations, second edition of DOT.
Professional and Managerial: Engineers (metallurgical, chemical, civil, electrical, industrial, and mechanical), social and welfare workers, trained nurses, draftsmen, laboratory technicians, healers and other medical occupations.
Clerical and Sales: Bookkeepers and cashiers, clerks-general office, general industry clerks, office machine operators, secretaries, stenographers, and typists, stock clerks, salesmen-insurance, salesclerks, salespersons, sales—except to consumers.
Service: Waiters and waitresses, kitchen workers, attendants—hospital, porters.
Skilled: Machinists, tool and die makers, machine shop occupations, welders and flame cutters, carpenters, plasterers, mechanics and repairmen—motor vehicle, mechanics and repairmen—other.
Semiskilled: Textile products occupations, machine shop occupations, occupations in the treatment of metals, chauffeurs and drivers, occupations in laundering, cleaning, etc.
Unskilled: Occupations in meat products, packing and filling occupations, transportation equipment laborers, warehousing and related occupations.
[2] Excludes domestic service occupations.
[3] May be some distortion because of sample inflation.
Source: U.S. Employment Service.

occupations account for 58 percent of the ES unfilled job openings. Hence, for those occupations numerically important in any community, the local Employment Service office most probably will have representation. The table and notes above express this information.

Nevertheless, it will still prove desirable to ferret out those opportunities existing in relatively large numbers in the community which are not reflected in ES unfilled job openings. To do this, the local job market analyst in conjunction with employer relations representatives, placement specialists, and counselors (in the local employment office) would make a list of occupations and industries, and from them of major establishments and local trade associations representing those groups in which the Employment Service does little or no business. By way of illustration, such a list might include the local telephone company, the electric light and power utility, the construction trades council, the one or two railroads serving the community, etc. An aid in compiling such a list would be the occupations appearing in small numbers among the unfilled job openings. It is relatively easy to spot these occupations and their related associations.[26]

[26] *The author tested this hypothesis by scanning the District of of Columbia metropolitan area unfilled job openings list. Familiarity with the employment pattern in the area enabled him to identify quickly such occupations as upholsterer, pressman, electrician, plumber, practical nurse, bank teller, surveyor, technician, and telephone operator for which it would have been only a formality in most instances to obtain the associated organizations or establishments.*

The next indicated task would be a series of visits to these groups and for judgments to be made of the demand and supply situation in these occupations. Judgments based on these interviews would range from the simple to the complex.

For example, it should be relatively easy to determine from the telephone company the job prospects for telephone operators, linemen, and a few other important and unique occupations.

At the local hospital or hospital association, it would be difficult to conceive of any reason why a hospital administrator could not list a number of occupations in which he is currently experiencing recruitment difficulties or anticipates problems. Keep in mind that the Employment Service interviewer will already have many answers *before* he talks to the hospital administrator. He will know of the difficulties in the clerical and stenographic groups, and in the supportive occupations such as maintenance men, cooks, dishwashers, porters, etc. He will mostly be seeking knowledge in those occupations peculiar to hospitals.

When the Employment Service man speaks to the carpenter union official, he will be inquiring only after the organized craftsman and apprentice. He will already know the job market for the nonunionized carpenter and helper because these groups are frequently well represented in the local offices penetration patterns.

In still another illustration, suppose it's the printing occupations in which there is one employer association, a union local, and two or three large employers and a host

of smaller ones. If the employer group or labor union could not adequately furnish the answers, then conceiveably some telephone inquiries to the two or three larger ones, utilizing elements of the training needs survey approach [27] of the Employment Service so successfully used to implement the Manpower Development and Training Act would be appropriate. This would be the most time-consuming aspect of the study and would probably be an infrequent occurrence. It must be borne in mind that exact parameters of need are not necessary. Where the figures are indefinite but large, a number of classes could be set up without risk. Where the numbers are small, perhaps one class could be initiated, either in vocational education, or for MDTA institutional or on-the-job training.

Admittedly, this is the segment of the proposed technique for which precise experience and experimentation are needed. In a very large metropolitan area, we visualize perhaps some 20 scheduled visits. Between two and three could be scheduled per day and would represent the largest single output of time in the study. In small areas, these visits would be scaled down accordingly. Visits should be structured, that is, a questionnaire should be prepared and sent out in advance. It might prove feasible for the analyst to be present at a meeting of the association or union to conduct a group interview.

An on-going job vacancy information collection program would obviate the necessity of association or employer visits for purposes of this technique because the data so collected would repreesnt the universe of opportunities in the area.

Unfilled Openings and the Business Cycle

The number of ES unfilled openings in 1966 reached its highest peak in the history of the Employment Service, corresponding to the equally unprecedented boom in the Nation's industrial establishments. Similarly, ES unfilled openings peaked in 1953 and 1956, 2 years in which employment opportunities were also plentiful. On the other hand, and as might be expected, the number of ES unfilled openings showed cyclical declines during the recession years of 1954 and 1958.

It would be reasonable to ask, therefore, whether the application of the proposed technique would suffer when unfilled openings dropped off in periods of economic recession.

A reduction in numbers of ES unfilled openings, because it would produce smaller magnitudes, would probably subtract somewhat from maximum usefulness of the technique when compared to its use in a brisk job market. Of course, low points in a business cycle tend to affect other techniques of long-range forecasting. Employer forecasts in periods of recession tend to underestimate needs substantially. And for those economists relying on decennial census data to establish a projection, how many incipient dangers would be present if the census count took place in a year which was above or below the "norm" for the period?

The fact of the matter, however, is that a downtrend in the level of employers' orders would not basically detract from the usefulness of the ES unfilled openings–OOH technique. We believe that in the kind of job market existing in the decade of the fifties and sixties, and probably in the decade of the seventies, there will be little diminution in the nature of structural unemployment. Mismatching of worker and job will undoubtedly still be considerable. Consequently, we would continue to expect a large proportion of hard-to-fill jobs.

There is some statistical support for this position. An examination of the job vacancy data in April 1965 and April 1966 reveals that even in those metropolitan areas with relatively high unemployment rates, the proportion of hard-to-fill jobs (those unfilled for 30 days or more) was relatively high. Specifically, in April 1965, Los Angeles and Charleston, (W. Va.) had an unemployment rate of almost 6 percent and New York almost 5 percent. These were the three highest rates in the 16-city sample. In none of them was the proportion of hard-to-fill jobs for the area as a whole less than 35 percent.

In April 1956, the same three cities still had the highest unemployment rates in the experimental study but the unemployment rate had fallen to approximately 4.4 percent for each. Again, the proportion of hard-to-fill jobs ranged between 40 and 50 percent for each.

It is not unreasonable to assume, therefore, that unfilled job openings will be capable of pinpointing the types of occupational needs at relatively high periods of unemployment. Moreover, a repeat study once a year (or more frequently) will enable the analyst immediately to be sensitive to changes in the job market and the meaning such changes would have for training plans and opportunities.

High-Employment Occupations in an Area

What of those occupations in which there is a considerable number of workers employed in the area and which do not show up in the hard-to-fill listings? If nothing else, these occupations generate needs for replacement. Even if there were no long-term growth, it would not be prudent for vocational schools to eliminate training for, say, stenographers.

These occupations can be spotted by referring to the occupational counts by area in the decennial census. Those with the largest numbers should be listed for further examination. To the extent they duplicate those already listed because of a hard-to-fill history, they present no problem.

What if the high-employment occupations have no hard-to-fill history? It seems to us that the OOH outlook would be controlling. If the outlook is for growth, we would recommend continuance of the vocational education classes in the locality. If the occupational outlook is for neither growth nor decline, we would also continue training but watch placement experience carefully. If, on the other hand, the prognosis was for a decline nation-

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[27] *MDTA Handbook—Chapter II, Training Needs Survey, March 1965.*

Estimated Career Openings for Craftsmen, Foremen, and Kindred Workers Resulting From Growth of Employment Requirements and From Retirements and Deaths, 1965–75

[In thousands]

Occupation	Employment, 1965 [1]	Employment requirements, 1975	Career openings, 1965–75		
			Total openings	Net growth	Deaths and retirements
Craftsmen, foremen, and kindred workers, all industries	**9,220**	**11,400**	**4,040**	**2,180**	**1,860**
Selected building trades, all industries	2,690	3,080	960	390	570
In construction industry	1,915	2,175	670	260	410
Carpenters	850	895	245	45	200
In construction industry	665	670	165	5	160
Bricklayers, stonemasons, and tile setters	205	230	60	25	35
In construction industry	180	200	50	20	30
Cement and concrete finishers	60	75	25	15	9
In construction industry	55	75	30	20	8
Electricians	385	445	135	60	75
In construction industry	165	200	65	35	30
Excavating, grading, and road machinery operators	245	330	125	85	40
In construction industry	190	265	105	75	30
Painters	410	435	130	25	105
In construction industry	285	305	95	20	75
Paperhangers	11	14	7	3	4
In construction industry	10	13	6	3	3
Plasterers	50	60	20	10	10
In construction industry	50	55	15	5	10
Plumbers and pipefitters	345	425	150	80	70
In construction industry	220	265	90	45	45
Roofers and slaters	60	70	20	10	8
In construction industry	55	65	20	10	8
Structural metal workers	70	100	45	30	13
In construction industry	40	60	30	20	8
Mechanics and repairmen	2,335	3,295	1,390	960	430
Automobile mechanics	770	880	230	110	120
Appliance servicemen	195	250	85	55	30
Television and radio servicemen	115	140	40	25	14
Business machine servicemen	75	105	40	30	10
Industrial machinery repairmen	165	185	40	20	20
Vending machine mechanics	20	25	7	5	2
Other	995	1,710	950	715	235
Machining occupations	640	730	230	90	140
All-round machinists	325	360	105	35	70
Tool and die makers	145	160	45	15	30
Setup men	45	50	14	5	9
Other	125	160	65	35	30
Printing craftsmen, except bookbinders	290	290	55	0	55
Compositors and typesetters	170	155	20	−15	35
Electrotypers and stereotypers	14	6	−6	−8	2
Engravers, except photoengravers	11	15	6	4	2
Photoengravers	15	15	3	0	3
Pressmen and plate printers	80	100	35	20	13
Other	2,000	2,380	785	380	405
Stationary engineers	255	275	85	20	65
Bakers	105	95	10	−10	20
Locomotive engineers	35	40	15	5	10
Millwrights	75	80	20	5	15
Sheet-metal workers [2]	50	65	25	15	9
Miscellaneous skilled workers	1,480	1,825	630	345	285
Foremen, not elsewhere classified	1,265	1,625	620	360	260

[1] The 1965 employment estimates for total skilled workers and the major occupation subgroups are from the Bureau's *Monthly Report on the Labor Force*, December 1965, table A–19, p. 42. The 1965 estimates for individual occupations were developed in the course of the Bureau's occupational outlook research program, using a wide variety of sources including unpublished Current Population Survey data, employment data derived from BLS wage and other surveys, union membership figures, data collected by government regulatory agencies, and miscellaneous employment information obtained from trade associations and other private groups. Actual 1965 employment levels by industry and estimated industry occupational staffing patterns were an important tool in making the 1965 employment estimates. In addition to employment data, use was made of related economic data in estimating employment in individual skilled occupations. For example, in developing estimates of vending machine mechanics in 1965 the number and kinds of vending machines in use and their estimated maintenance requirements were considered in arriving at the final employment estimate of these workers.

The classification of individual occupations into given groups is that used in the Current Population Survey. It differs somewhat from the occupational classification system followed in the *Occupational Outlook Handbook* which is based on an independent analysis of the job content of individual occupations. For example, in the *Handbook*, millwrights are classified as mechanics and repairmen and not as "other craftsmen;" maintenance electricians are classified as mechanics and repairmen and not as building trades craftsmen.

[2] Includes an estimate of the number of sheet-metal workers in the construction industry and those performing construction-related work in all other industries. Excluded are workers such as aviation metalsmiths, pattern cutters and developers in the motor vehicle industry, and template layout men in industry, as classified in the U.S. Census of Population category, "Tinsmiths, coppersmiths, and sheet-metal workers."

NOTE: Because of rounding, sums of individual items may not equal totals.

Source: U.S. Bureau of Labor Statistics.

ally and there was not a hard-to-fill experience locally, we would recommend contraction of training in the absence of other extenuating circumstances.

The New Dictionary of Occupational Titles (DOT)

The third edition of the DOT, released in 1966, provides a different structure of occupational classification from the two editions preceding it. Among the innovations introduced was one which has significance for the counseling field and for vocational education and MDTA training programs. The structure as now devised, groups occupations according to some combination of body of knowledge required, purpose, industry, materials worked with, product, and/or service.

The end result is a structure which clusters occupations with like characteristics under a common heading and also which groups occupations in a "skill ladder." Specifically, with respect to clustering, under *metal machining* are included the following 10 three-digit occupation groups: Machinists and related, toolmakers and related, gear machining, abrading, turning, milling and planing, boring, sawing, and metal machining cccupations, n.e.c. The latter three-digit grouping contains the "production-machine operator", which together with entry-level jobs in the other three-digit groups, feed into virtually any of the 10 three-digit groupings.

With respect to the skill ladder, each three-digit occupational group has within it the range of occupations proceeding from the top skill in the group down the promotion ladder to the entry occupation. Thus, for the three-digit occupational group "machinist and related," there are included the highly skilled machine shop foreman, the all-round machinist, layout man, machinist apprentice and instrument-maker helper. These occupations are only a sampling of the full range of occupations included in the three-digit level of complexity skill ladder.[28]

Since each of these three-digit occupational groups related to one another in terms of materials worked with, product, etc., it follows, therefore, that at the entry level of all of these occupational groups, the training required is somewhat similar. Consequently, *job opportunities at the entry level* would be the number of needs listed for all of the occupations in the 10 three-digit groups. For surely, if there is an unfilled need for a machinist, a boring machine operator, and an entry production-machine operator—three in all—then presumably *in the absence of skilled supply,* the need would be to train three entry workers in metal machining occupations. If an employed boring machine operator had sufficient skill to qualify for the machinist's job through upgrading, that would still leave a need for three workers; i.e., two boring machine operators and one entry production-machine operator; *assuming no adequate supply,* the training would still be in terms of three entry workers in metal machinery occupations. To pursue the point for the sake of clarity, if both a machine operator and an entry production-machine operator were upgraded, the net need would remain at one machine operator and two entry production-machine operators; *assuming no supply for the machine operator,* the training need would remain at three entry workers in the metal machinery occupations.

If the above thesis is correct, it follows that any survey which estimates total opportunities for a list of skills such as baker, machinist, or electrician is only measuring a part of the need. The forecasting technique would have to consider the needs of the entire family of occupations—both horizontally to include a number of related six-digit occupations and vertically to include the entire three-digit skill ladder.

There are 603 three-digit occupational groups in the third edition of the DOT. In the case of metal machining, it was feasible to group 10 such three-digit groups—600 through 609—for a family cluster. However, the feasibility of grouping other three-digit groups is a matter for different handling. Some clusters might consist of only one or two three-digit groups. The task of dividing the 603 three-digit groups into homogeneous clusters is not too difficult and would take a trained occupational analyst only a matter of a week or two. This clustering determination would need to be done only once after which it could serve all comers until such time as there might be a major change in the definition and structure of occupations.

The theory of occupations clustering provides the justification for adding together one or more three-digit codes. In the unfilled job openings-OOH technique, the same theory justifies the addition of related groups of three-digit occupations. This would result in fewer occupational identities but in larger numbers attached to those groups which emerge.

Let us assume further that a vocational education course or an institutional course under MDTA actually trains a student to the level of a skilled worker, or for that matter to any level identifiable by a six-digit code in the new DOT. All that is needed is to break out that six-digit code in the listing of unfilled job openings or job vacancies and to correlate it with the OOH outlook.

Here then, in summary, is a grouping technique whose usefulness for long-range forecasting and for vocational planning and MDTA is well-suited.

The educator who is anxious to obtain a curriculum which exposes the student to a skill cluster rather than to an occupational pinpoint will find that the new DOT provides this mechanism;

The job market analyst, whose problem is to measure the opportunities in a total field of work with similar job characteristics and skill transferability, will achieve greater reliability in his estimates;

At the same time, with slight modification in technique, the DOT can provide both the educator and the job market analyst with information on opportunities in specific occupations (e.g., key punch operator, stenographer, auto mechanic, and welder) if the job market demands such workers and the training curriculum can produce qualified trainees.

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[28] *For full listing of occupations in three-digit group, see p. 121, vol. II, third edition of the* Dictionary of Occupational Titles.

There is another development in the field of clustering which deserves mention. The U.S. Office of Education is currently evolving a clustering technique based on occupational titles in the third edition of the DOT. This technique is predicated on starting with the courses given in the vocational education system and classifying under each of them the occupations which are part of the "family." Such a grouping would merit special consideration because it is tied to a pragmatic situation, namely, the actual courses as they are structured and identified in the vocational education system.

Postulates of a New Technique

An assessment of any new technique should take note of the following basic observations:

1. The foremost consideration is that any technique developed for widespread use to produce quick results on a continuous basis *must be a relatively simple one.* Budgetary considerations inhibit, if not rule out, an expensive approach. Lack of technical know-how and budgetary resources probably rule out those econometric models produced thus far.

2. The quest for preciseness and for emerging occupations in the forecasting area is not necessarily meaningful for training purposes.

3. The unfilled job openings (job vacancy)–OCCUPATIONAL OUTLOOK HANDBOOK (matrix) approach is not without its limitations. Its limitations, however, are no worse than those in other known techniques and the results, in our judgment, are at least as good and perhaps better.

4. A forecasting system not predicated on the measurement of *supply* as an offset to demand is of overall questionable value. The hard-to-fill (openings unfilled 1 month or more) concept, albeit a simple one, is an adequate and realistic supply measure.

5. Any occupational forecasting system which does not have basic data originating on the local scene runs a chance of being divorced from reality. The unfilled openings-OOH approach starts with, and indeed is predicated on, a local area's experience, currently and over a period of time. Of course, unfilled openings data may be analyzed, geographically, on an area larger than a standard metropolitan area. In fact, we recommend a statewide survey, broken down into a number of smaller components, namely geographical units of SMSA's.

6. The third edition of the DOT is a technical device whose potentialities for providing information on clustering and avenues of promotion should be harnessed to a long-range forecasting technique. The U.S. Office of Education clustering concept, translated into DOT terms, may be a useful supplement, or possible substitute.

7. Applying the unfilled job openings-OCCUPATIONAL OUTLOOK HANDBOOK approach requires judgment of the local employment office economist or job market analyst. The job market analyst on the scene, dealing with data generated out of his own operations and with continuous economic review of his area, is in the best position to draw valid conclusions. Moreover, by placing this responsibility in the local office, the Employment Service will be discharging its mandate under the law to provide such information.

Conclusion

Development of a technique to forecast long-range occupational requirements to satisfy the needs of the Manpower Development and Training Act of 1962, the Vocational Education Act of 1963, and the Economic Opportunity Act of 1964 has bedeviled manpowers economists for years.

The area skill survey technique, the best known and longest used, has come in for severe criticism on the grounds that it is too expensive and time-consuming, and that most employers are not good economists.

The dilemma has been that up to now no one (in our judgment) has come up with a viable technique of forecasting long-range occupational requirements. The office of Manpower Policy, Evaluation, and Research in the Department of Labor has funded a number of contracts with universities under title I of the Manpower Development and Training Act to produce acceptable techniques. A modest estimate of these costs totals about $150,000. The resulting techniques are extremely expensive and difficult to perform. We leave an assessment of their technical adequacy to other reviewers.

The Bureau of Employment Security, estimating that skill surveys cost an average of $20,000 each, requested for fiscal year 1968, $3 million over a period of 2 years to conduct such surveys in 150 of the largest metropolitan areas. A like amount would be requested every 2 or 3 years. It is true that these surveys would also have produced employment benchmarks for a limited number of occupations by area, a product not visualized in the ES unfilled openings-OOH approach.

The ES unfilled openings-OOH approach, in our judgment, can and will work. It is relatively simple and can be transmitted quickly. Its elements are the unfilled job openings in a local employment office, identification of those jobs open 30 days or more, and the addition of a national forecast tempered by the local analyst's knowledge and supplemented by a few association visits.

It is possible that an indeterminate number of areas, because of an unusually low number of ES unfilled openings and the absence of job vacancy data, may not be suitable for the application of this technique. The scope of this limitation rests on individual examination of each area's data.

We estimate that the conduct of an unfilled job openings-OOH survey to satisfy vocational education, MDTA, and Office of Economic Opportunity needs would take a single manpower economist an average of not more than 6 weeks for a survey in a metropolitan area. Total cost to the Employment Service for 150 areas: Up to $200,000 and undoubtedly less as experience is gained, all 150 areas to be completed in 1 year and repeated at 1-year intervals. This sum does not include collection of ES unfilled openings data which are now collected in 80 areas and are scheduled to be expanded to 150 areas, with or without the application of this technique.